

cotton, the development of a potato relatively immune to fungous diseases, an increased production of fruit or the introduction of hardier varieties, of some that are earlier, of others that are later, to say nothing of the improvement of flowers in form, colour, and perfume, are all points of great importance and of very great interest from a biological point of view.

In this field of work Mr. Burbank has long been known as an energetic labourer, and it is quite possible that in actual amount his work bulks larger than that of any of his predecessors or his contemporaries. Moreover, as we learn from the book before us, and from other sources, the experimenter is a man of high purpose, modest, and amiable. It is for these personal reasons we imagine that he will have cause to regret the appearance of this volume. We have no desire to belittle Mr. Burbank or to undervalue the importance of what he has accomplished. We believe that he would be the first to acknowledge that there existed strong men previous to the appearance of Agamemnon. But this is a fact that his eulogist does not sufficiently estimate. In perusing the glowing paragraphs of this volume the casual reader might imagine that there were no plant-breeders before Burbank, or that their labours were comparatively insignificant, and yet in our own country alone we seem to have heard of Thomas Andrew Knight, of Dean Herbert, of Trevor Clarke, of Thomas Rivers, of John Laing, of Dominy, of Seden, of Laxton, and of a large number of others whose productions at least vie in importance with those of the American experimenter, whilst a visit to the great establishments of Vilmorin, near Paris, Benary, and others at Erfurt and Quedlinburg, as well as to the trial-grounds of our Veitchs, Suttons, Carters, and many others, would show that the great American hybridist is by no means without a rival in his line of work.

It would hardly be fair to criticise those products of Mr. Burbank's skill and perseverance that have reached us, because it may well be that they are not yet adapted to our climate. At any rate, to name only a few instances, the Burbank plum, the Burbank lily, the Shasta daisy, all so enthusiastically spoken of in the pages of this book and elsewhere, have not, in this country, justified the encomiums passed upon them by the American Press.

When we read of Mr. Burbank's methods of work we do not find anything different from the practices of our "raisers," who are too modest to speak of their efforts as "creations."

Among the "creations" mentioned in this volume is the "thornless edible cactus." Surely we have heard of and seen a spineless *Opuntia* before attention was called to it in this volume, where it is stated that "nothing more marvellous has ever been done in plant-life"!

Again, "the rare effects developed in the transformation of the columbine" do not differ (so far as we can tell from the illustration facing p. 359) from the stellate columbine known in our gardens for centuries and figured on p. 273 of Parkinson's *Paradisus* (1629).

A man who has experimented on such a colossal

scale for so long a time might be expected to have gathered valuable information on such points as heredity, adaptation, inheritance of acquired characters, as well as formed opinions on Mendelism and mutation. We gather from the book before us that Mr. Burbank's attention has, almost of necessity, been directed to these subjects, and we earnestly hope that now that the Carnegie Institution has granted him a subvention of ten thousand dollars a year for ten years he will find time to record and coordinate his experiments for the benefit of future workers and the increase of biological knowledge.

Incidentally, we glean that Mr. Burbank is not inclined to accept the views of Weismann or of Mendel, but that he looks favourably on the mutation theory of De Vries. Surely no practitioner has had better opportunities of judging of these matters than has Mr. Burbank, and if he will give us his own experiences in his own words, rather than in those of some too partial biographer, the world will be the gainer, and the value of Mr. Burbank's work more accurately gauged than it can be from the perusal of the present volume.

CHEMICAL TECHNOLOGY.

Chemische Technologie. By Dr. Fr. Heusler. Pp. xvi + 350. (Leipzig: B. G. Teubner, 1905.) Price 8 marks.

THE author states in the preface that the work is intended for the use of merchants. This at once opens up the question whether a book of this kind, ostensibly written for non-chemists, can fulfil its object. The author is under the impression that a merchant has acquired, in the course of his secondary education, sufficient knowledge to read and interpret chemical equations, and he adopts in his work chemical symbols throughout, in the belief that it would be almost an insult to the German merchant to think him incapable of understanding chemical equations.

The reviewer cannot agree with this opinion in its broad generality. His own experience would lead him to confirm in this respect the truth of the trite old saying, "A little knowledge is a dangerous knowledge." When the commercial director of a chemical works asks his chemist, in times of stress, to use a sulphuric acid of 50° Bé instead of 66° Bé on the score that the former is so much cheaper for the same amount of sulphuric acid, or when the chief clerk struts through the works meddling with the chemistry of the business, then the chemist would certainly prefer the English system of subdividing the work. Of course, there are merchants who are fully able to understand purely chemical questions, but such merchants would certainly have recourse to the extensive manuals on their own specialities rather than study the present work, in which the information on every subject must necessarily be very meagre.

From this point of view the book is not within the horizon of the average chemical merchant. The tendency to explain the subject so far as possible by equations necessarily leads to a twisted and sometimes wrong representation, as these may be read to

mean complete chemical changes, whilst often enough they only express part of the chemical change that is going on. Statistical data, the most useful information to a merchant, are very imperfectly given. Whilst, e.g., the statistics of ammonium sulphate refer to the years 1902 and 1903, other more important branches of chemical technology hark back as far as the 'eighties of last century.

If the question be asked whether this book would prove useful to a chemist, a much more favourable opinion can be pronounced. The work will be found very helpful, as a kind of "Repetitorium," to a chemist who is reading up for examination. Regarded in this light, the book may be said to have been written concisely and to contain an enormous amount of information, put together in a clear and transparent form. Naturally, the attempt of one single author to press the wide range of chemical technology into one small volume carries with it the germ of defect. For in the present state of chemical technology it is clearly impossible for any single person to write on every branch with the necessary authority or even necessary knowledge. The inevitable consequence of such an ambitious endeavour is that books of this kind bear too patently the stamp of writing-desk work. Only in the case of the electrolytical processes dealing with alkali chlorides the author has called in the assistance of an expert. He would have done well to have extended this invitation to other specialists. We therefore find throughout the book many statements which could have been put right by an expert, and we also notice some important omissions. Moreover, some of the weakest chapters, such as those on "leather industry" and "fats and oils," would have been brought into line with the aforementioned chapter on electrolysis. The least satisfactory part of the book are the illustrations. Some of them have done service for half a century, and might have been given their well-earned rest. Others are more in the nature of pictures which convey no information. Others, again, such as the illustration of a native indigo plant, can only provoke a smile.

J. L.

OUR BOOK SHELF.

Future Forest Trees. By A. H. Unwin. Pp. 108. (London: T. Fisher Unwin, 1905.) Price 7s. 6d. net.

WITHIN recent years our forestry literature has been rapidly and steadily on the increase, which may be taken as a sign that more attention is now being given to matters silvicultural than formerly. The above work is one of the most recent additions, and its thoroughly sound, practical, and scientific character should secure it a wide circulation, not only in this country, but also in America, to which it equally refers.

The title chosen by the author, "Future Forest Trees," refers to those exotic, deciduous, and coniferous species of East, West, and North American trees which might with advantage be introduced into our forests. The work embodies the author's own personal experience, as well as the results gained by more than 100 years of extended experiments which have been carried out in Germany.

The selection of exotic species as future forest trees is not by any means so easy a task as one might at first sight suppose. To justify its introduction and cultivation the new species must have some distinct advantageous characteristics which are not possessed by our indigenous trees, such as greater rapidity in growth, greater resistance to adverse climatic conditions (for example, wind, heat, cold, rain, and snow), greater adaptability to the poorer classes of soil, and such like.

It is to Prof. H. Mayr, of Munich, to whom this book is dedicated, that we are indebted for so much valuable information on this very important question, especially as regards the geographical distribution of forest trees.

The first part of the book deals with the imports of American timber to the German market. Importing timber to Germany, the home of forestry, sounds a little like carting coals to Newcastle; nevertheless, there are at least two sufficient reasons, firstly, because some of these timbers are at present not cultivated in that country, and, secondly, it is a well-known fact that the world's supply of timber is not inexhaustible, and is, in fact, rapidly on the decrease. Hence, while Germany can obtain timber at a reasonable price from abroad, she is conserving her own forest reserves with the full knowledge that at no very remote date the price of timber will have risen to a figure which will amply justify this policy of conservation. Part ii. gives the general results of planting experiments with American trees in Germany, Austria, Great Britain, and Switzerland; and part iii. deals with the silvicultural characteristics and treatment of the various American species of trees.

We heartily commend this book to all those who are interested in or connected with forestry, as it forms an excellent guide to the cultivation of species which are likely in the course of time fully to justify their introduction.

Elements of Quantitative Analysis. By Dr. G. H. Bailey. Pp. x+246. (London: Macmillan and Co., Ltd., 1905.) Price 4s. 6d.

AFTER the consideration of some preliminary matters, the author, within the compass of less than two hundred small pages, treats of almost every branch of quantitative chemical analysis, including minerals of many sorts, water, fuel, the products of alkali factories, manures, organic substances, soap, oils and fats, and gases. It follows that the space devoted to each section is very small, and in many cases it would be more correct to say that the methods are indicated rather than described. This economy of words and space sometimes leads to instructions that might cause accidents, as in the description of Kjeldahl's method of estimating nitrogen, where the student is instructed to boil the substance with fuming sulphuric acid, &c., then to "allow to cool and add a tolerable excess, about 50 grams will suffice, of caustic soda. . . . Distill off the ammonia," &c. In other cases the desire to be brief leaves the student without instructions, as in the analysis of water, in which he is told to determine the free and albumenoid ammonia, and referred for the method to a simple description of the estimation of ammonia by Nessler's solution. On the other hand, it is a pleasure to notice that some methods are given that are not generally known, such as the colorimetric estimation of titanium by means of hydrogen peroxide.

The educational value of the work suggested (to which the author refers in his preface) would have been enhanced if the chemistry of the operations and the specific aims of the advisable manipulative pre-